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EMBRYOLOGY.[1]

On the Development of Nereis dumerilii.[2]—Though this is but the first part of a contribution to the development of Annelids, to be followed by an account of the formation of the organs, yet the untimely death of the author makes it almost necessary to regard the present contribution as complete.

The very interesting series of forms discovered by Claparède in this single species, *N. dumerilii*, have been again studied by the present author, who believes their interrelations to be the following:

A small Nereis 12-15 mm. long in an immature state may have two quite different fates. It may transform in September and October into a pelagic Heteronereis, becoming sexually mature in February and March, and depositing pelagic eggs that contain little yolk and develop *with a metamorphosis;* it may grow to a length of 15-30 mm. and then become sexually mature as a Nereis laying eggs in tubes in April to July, which eggs contain much yolk and develop *without a metamorphosis;* or still growing, in June and July become a Heteronereis 55-65 mm. long that lays eggs in tube, with little yolk and *probably* developing with a metamorphosis.

There are thus two *Heteronereis states,* a little one with pelagic habits and metamorphosis and a large one without any pelagic life, and unknown, probably, indirect development. There are two *Nereis states,* one small and immature, the other large and either on the road to the large Heteronereis state or becoming a sexual Nereis with a direct development. It is this last large sexual Nereis that is treated of in the present article.

Obviously much yet remains to be done here by one having control of aquaria for long periods, as it is still unknown what may be the causes leading to the acquirement of these various states or whether there is any regular sequence or alternation in their occurrence. This could be done upon the common, equally polymorphic, Nereis of our coast!

In all forms of *Nereis dumerilii* the sexes are separate. In the large Nereis state studied, the females readily lay the eggs in transparent tubes (secreted by the parapodial and other epidermal glands)

[1] Edited by Dr. T. H. Morgan, Bryn Mawr, Pa.

[2] Dr. C. V. Wistinghausen in Mitth. Zool. Sta. Neapel. 10, July, 1891, pp. 41–72. Pl. 6–7.

when kept in aquaria with ulva, which they eat. The male enters the tube only to fertilize the eggs as they are laid. From the tubes the eggs may be removed with care from holes cut in the side; but the female must not be disturbed, as the undulatory movements of its body within the tube are necessary in supplying the eggs with fresh water.

When no male is present the females abandon the tubes and lay the eggs at random in the water, where they do not develop.

No time limits can be set to the processes of development, as they vary so exceedingly at different temperatures. It is interesting to note that the author finds the Winter season very unfavorable, since a large proportion of the eggs then develop abnormally in the laboratory, but not outside. This would seem another illustration of the advantage derived from a climate in which air and water are of about the same temperature. At Messina the eggs are laid, in aquaria, between eleven and twelve in the morning regularly, this being a decided exception to the many cases in which the night time is the laying period.

In the investigation both surface views and sections were made use of, the former either alive or stained in Kleinenberg's hæmatoxylin after hardening in picro-sulphuric, while the section material was hardened in Fol's modification of Flemming's fluid.

The author's summary of results obtained is about as follows: Cleavage is total and unequal; four blastomeres bud off four micromeres called *encephaloblasts*, as they give rise to the cephalic ganglia and all the sense organs of the head. The largest of the four micromeres buds off *two* large cells called *somatoblasts*, as they form all the body except the mid gut and the epidermis. The three other micromeres, equal in size, bud off each two small cells, and these *six* micromeres take no part in the formation of organs, but merely form the epidermis and the larval prototroch.

The embryo arises from two quite separate masses, the one, the trunk arising from the two somatoblasts, the other, the head, formed by the four encephaloblasts. These two elements subsequently unite. The embryo is hatched with three pairs of functional parapodia, the development being thus direct.

Without the aid of the author's figures it is difficult to explain many of the points of interest in the paper, not all of which are included in the above summary.

The large amount of yolk present remains in four masses, the micromeres, which are epibolically overgrown by a very thin layer of nucleated protoplasm furnished by the cells budded off from the micromeres, namely the four encephaloblasts, two somatoblasts and six micromeres.

These four micromeres form the digestive tract, the other cells the ecto- and mesoblasts. The four yolk masses at first have but one nucleus each, but subsequently by what seems amitotic division, new nuclei, accompanied by a little protoplasm, arise in the yolk and envelops it in such a way as to preserve the original lines of cleavage between the four masses. These come to lie around, not in, the digestive tract, the yolk being still in four masses in the latest embryo.

The persistence of these cleavage planes of the micromeres enables one to refer them to the subsequent planes of the animal.

The animal pole is anterior, and the first two meridianal planes result in the formation of two smaller central cells and a small and a larger dorsal cell, the larger cell being on the left of the animal.

Without entering into the author's comparison between the phenomena found in this Nereis and those recently discovered in other Polychætæ, Oligochætæ and leeches we must refer to the way in which the two somatoblasts give rise to the trunk as it bears upon the question of "teloblasts." The first formed somatoblast divides into four cells in a transverse row, and these again divide to form a parallel row from which other cells bud off, making twelve in four longitudinal rows, two on each side the median plane. The division of the second somatoblast results in the formation of three transverse series, of which the upper is composed of five or six larger cells that seem to give off the other cells in longitudinal rows. These six larger cells sink in and as *myoblasts* form the musculature, while all the other descendants of the somatoblasts form nervous system, setæ sacs, etc.

Obviously all these cells represent the "ventral plate" found by Wilson in a Heteronereis, while the two somatoblasts are identical with the "primary toloblasts," though Wistinghausen seems to avoid the use of the term teloblast as long as there are no long lines of cells leading directly from a mother cell to the formed organ.

The prototroch forms but a rudimentary simple band of ciliated cells rotating the embryo. The anus would appear to arise at the point of closure of the blastopore. The formation of organs in the trunk, on the surface of a spherical mass of yolk has much to recall stages in the embyology of an arthropod. Finally the head and trunk organs unite when the œsophageal commissures are formed by growths from both foundations.

The embryo elongates and hatches in an imperfect state with three pairs of setigerous parapodia, partly formed fourth somite, head and tail, anal and cephalic tentacles.

A just estimate of the paper can be formed only with the appearance of the full account of the American species studied by Wilson. From the preliminary account it seems that, allowing for the differences due to a direct and an indirect development and the difficulties offered by an opaque as opposed to a transparent object; the embryology of these two species of Nereis has very much in common, strengthening the theoretical conclusions that may be drawn from either and rendering of little use the previous imperfect studies of the same subject.

Development of the Lobster.[1]—Mr. H. C. Bumpus publishes a contribution to the Embryology of the American Lobster. Many females seem to be impregnated with spermatozoa long before they are able to deposit eggs, which cannot take place until a year if not two years later. The author has discovered in the female a receptive apparatus for the spermatozoa. " This organ lies at the posterior end of the sternum of the female lobster, resting between the bases of the IV and V pairs of thoracic appendages."

The eggs are deposited (on abdomen) in July and August, and develop rapidly so long as the water is relatively warm. Certain precocious eggs may exceptionally hatch before winter. This is not the rule, for ordinarily the eggs hatch between the middle of May and the middle of July of the following year.

The nucleus of the egg divides and re-divides before the protoplasm (and yolk) of the egg shows any traces of division. When nuclear division has taken place about three time elevations and furrows appear on the surface, at first only at the animal pole.

Later the lower pole is divided and all the furrows extend deeper into the yolk, "though there is shown a central mass of yolk that remains undivided." On the third or fourth day after oviposition the Gastrula is formed.

The rest of the paper deals with the later stages of development.

Embryology of the American Alligator.—Dr. S. F. Clark publishes in the September number of the Journal of Morphology[2] a paper on the habits and embryology of the American Alligator. The first part of the paper deals with the author's visits to Florida and his own and others' observations on the habits of the alligator.

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[1] Journ. Morph., Vol. V, No. 2.

[2] Journ. Morph., V, No. 2.

The times of laying lie between June 9th and 17th, "while it is probable their eggs are occasionally laid somewhat later. I doubt if they are ever laid much before the 9th."

The nest is very large and is built by the female, and it is probable that the same nest may be used more than once but not more than once each year.

In counting lots of eggs the number averaged twenty-eight each. Fine plates accompany the paper giving the superficial structure of the stages of development. Unfortunately none of the internal changes are given, and the text is a very brief description of the fifty-one figures.

The author's purpose is to furnish a general account or outline of the forming of the alligator as seen in external features.

"I have been led to do this by reason of the entire lack of any embryological knowledge of the alligator group, and on account of there still being something to be desired in the way of a set of general figures illustrating the development of a reptile."

ENTOMOLOGY.[1]

The Ox Warble Fly.—*The Journal of Comparative Medicine and Veterinary Archives* for June, 1891, contains an article by Dr. Cooper Curtis upon the "Oxwarble in the United States." Dr. Curtis reviews the literature of the subject and shows that what American writers have thought to be *Hypoderma bovis*, is really *H. lineata.* Larvæ of this insect having been found in the œsophagus, under the pleura near the eleventh rib, and in the subcutaneous tissue of the back, led Dr. Curtis to conclude that the life history of this insect is not as has been supposed; i. e. that the eggs are laid along the backs of cattle, and upon hatching, the young larvæ bore into the skin. If no larvæ or "wolves" are found in the backs of cattle until January, it is probable that the eggs are taken into the mouth and the larvæ go from the œsophagus to the back.—HOWARD EVARTS WEED, *Mississippi Agricultural College.*

Spontaneous Ignition of Carbon Bisulphide.—According to a recent issue of the *Scientific American Supplement,* Dr. Max Popel

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[1] Conducted by Prof. C. M. Weed, Hanover, N. H.